

Claims

- [c1] A method of sampling reservoir fluid, comprising:
- establishing communication between a reservoir and an entry port of a flow line disposed in a borehole penetrating the reservoir;
 - separating fluid received in the entry port into individual fluid components and sequentially flowing slugs of each individual fluid component along the flow line;
 - observing the slugs as they move along the flow line in order to determine the composition of the slugs;
 - estimating when a desired slug containing a desired fluid component would be in the vicinity of a sample chamber in the flow line; and
 - opening the sample chamber to capture the desired slug when the desired slug is in the vicinity of the sample chamber.
- [c2] The method of claim 1, further comprising closing an exit port of the flow line at approximately the same time as opening the sample chamber.
- [c3] The method of claim 1, wherein opening the sample chamber to capture the desired slug comprises pumping the desired slug into the sample chamber.

- [c4] The method of claim 3, wherein pumping the desired slug into the sample chamber comprises pressurizing the content of the sample chamber.
- [c5] The method of claim 1, wherein separating fluid and sequentially flowing slugs comprise passing the fluid received in the entry port through a pump.
- [c6] The method of claim 5, further comprising monitoring a hydraulic pressure of the pump to determine whether opening the sample chamber to capture the desired slug is successful.
- [c7] The method of claim 6, wherein the hydraulic pressure of the pump increases rapidly when the sample chamber becomes full.
- [c8] The method of claim 1, wherein observing the slugs comprises determining whether the slugs contain a single hydrocarbon phase.
- [c9] The method of claim 8, wherein the desired slug contains a single hydrocarbon phase.
- [c10] The method of claim 1, further comprising closing the sample chamber after capturing the desired slug.
- [c11] The method of claim 10, further comprising verifying that

the sample chamber is closed by closing an exit port of the flow line and monitoring a hydraulic pressure of a pump in the flow line while attempting to pump fluid from a side of the pump closest to the sample chamber to the other side of the pump, wherein a rapid increase of the hydraulic pressure of the pump indicates that the sample chamber is closed.

[c12] The method of claim 1, further comprising recording flow conditions at various locations in the flow line and composition of the slugs moving through the flow line, the record being usable for auditing capture of the desired slug.

[c13] A system for sampling reservoir fluid, comprising:
a tool body having a flow line with an entry port and an exit port, the tool body being adapted to be suspended in a borehole penetrating a reservoir;
a fluid separator installed in the flow line for separating fluid received from the entry port into individual fluid components and sequentially outputting slugs of each individual fluid into the flow line;
a fluid analyzer installed in the flow line downstream of the fluid separator for determining the composition of the slugs as they move along the flow line; and
at least one sample chamber installed in the flow line downstream of the fluid analyzer for capturing a desired

slug containing a desired fluid component.

[c14] The method of claim *13*, wherein the fluid separator is a dual-displacement pump.